

### **REMARKS**

Reconsideration of the present application is respectfully requested in view of the arguments set forth herein.

In the Office Action, claims 39-56 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Rajagopalan (U.S. Patent No. 6,656,840) in view of Lam (U.S. Patent No. 6,548,418). Applicants respectfully traverse the Examiner's rejections.

As the Examiner well knows, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991); M.P.E.P. § 2142. Moreover, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988); M.P.E.P. § 2143.03.

With respect to alleged obviousness, there must be something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561 (Fed. Cir. 1986). In fact, the absence of a suggestion to combine is dispositive in an obviousness determination. *Gambro Lundia AB v. Baxter Health-*

*care Corp.*, 110 F.3d 1573 (Fed. Cir. 1997). The mere fact that the prior art can be combined or modified does not make the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); M.P.E.P. § 2143.01. The consistent criterion for determining obviousness is whether the prior art would have suggested to one of ordinary skill in the art that the process should be carried out and would have a reasonable likelihood of success, viewed in the light of the prior art. Both the suggestion and the expectation of success must be founded in the prior art, not in the Applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991; *In re O'Farrell*, 853 F.2d 894 (Fed. Cir. 1988); M.P.E.P. § 2142.

The Examiner concedes that Rajagopalan does not disclose a very fundamental aspect of the present invention – that the concentration of silicon in the silicon nitride layer gradually increases from the first surface to the second surface. Despite the admitted absence of this fundamental aspect of the presently claimed inventions, the Examiner, citing to Lam, concludes that the inventions defined by the pending claims would have been obvious. Applicants respectfully disagree.

Rajagopalan is understood to be directed to a process of forming first and second layers of silicon and an element (nitrogen or carbon), wherein the atomic ratio of the element (e) to silicon (e/Si) is greater in the first layer than in the second layer. Col. 2, ll. 25-35. Rajagopalan discloses that the gas flow rates of one or both of the process gases may be adjusted to achieve the desired atomic ratios in the first and second layers. Col. 4, ll. 44-49; Col. 11, ll. 34-36. In a particular example described therein, Rajagopalan discloses that the flow rate of silane may be increased during the formation of the second layer to achieve the desired atomic ratio. Col. 5, l.

54 – Col. 6, l. 5. Even more specifically, Rajagopalan discloses that the first layer may be formed with a silane flow rate of about 27 sccm, whereas the second layer may be formed with a silane flow rate of about 110 sccm while the nitrogen flow rate may be maintained at about 5000 sccm in forming both the first and second layers.

As admitted by the Examiner, Rajagopalan is silent as to the concept of forming a single layer wherein the concentration of silicon gradually increases as recited in the pending claims. The citation to Lam cannot cure this fundamental deficiency Rajagopalan – the Examiner’s primary reference. First, all of the pending claims are directed to forming a dielectric barrier layer on an exposed copper surface. In stark contrast, Lam is directed to a method of forming an improved etch stop barrier layer. See, *e.g.*, Abstract; Col. 1, ll. 54-62. Lam is directed to the formation of an etch stop layer that will purportedly solve some of the problems identified by Lam in the background section of that application.

To solve these problems, Lam discloses the formation of a first layer of silicon nitride 16 over the substrate 10, followed by the formation of a second silicon nitride layer 18 over the first layer 16. According to Lam, the first layer 16 is silicon poor relative to the second layer 18. Col. 3, l. 44 – Col. 4, l. 7. Lam goes on to note that a silicon nitride layer can be formed with a gradient of silicon concentration throughout the layer. Col. 4, ll. 54-65.

It is respectfully submitted that one skilled in the art, when attempting to form a dielectric barrier layer on an exposed copper surface, as currently set forth in the pending claims, would not be motivated to combine the references in the manner suggested by the Examiner. Lam is expressly directed to problems associated with etching processes. More specifically, Lam is directed to the formation of an etch stop barrier layer above a semiconductor substrate – it has

nothing to do with preventing the migration of copper from an exposed copper surface, as does the presently claimed barrier layers. The Examiner offers no plausible reason why one skilled in the art would be magically motivated to combine the teachings of Lam (which deals with etching processes and the formation of an etch stop layer) with those of Rajagopalan. Without this motivation or suggestion to combine Rajagopalan and Lam, the obviousness rejection is legally improper.

A recent Federal Circuit case makes it crystal clear that, in an obviousness situation, the prior art must disclose each and every element of the claimed invention, and that any motivation to combine or modify the prior art must be based upon a suggestion in the prior art. *In re Lee*, 61 U.S.P.Q.2d 143 (Fed. Cir. 2002). Conclusory statements regarding common knowledge and common sense are insufficient to support a finding of obviousness. *Id.* at 1434-35. “Our case law makes clear that the best defense against the subtle but powerful attraction of hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references.” *Teleflex v. KSR Intern. Co.*, 119 Fed. Appx. 282 (Fed. Cir. 2005) (unpublished) (citations omitted). It is respectfully submitted that the Examiner’s assertion that the inventions defined by the pending claims would have been obvious in view of Rajagopalan and Lam constitutes an impermissible use of hindsight using Applicants’ disclosure as a roadmap.

For at least the aforementioned reasons, it is respectfully submitted that all pending claims are in condition for immediate allowance. The Examiner is invited to contact the undersigned attorney at (713) 934-4055 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

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